RE-CONSIDERING AGRI-ENVIRONMENTAL PREMIUMS: THE IMPACT OF FIXED COST IN ENROLMENT DECISION.

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ABSTRACT

Agro-environmental schemes are the main policy instrument currently available in the EU to promote environmentally friendly farming practices. Nevertheless, the adoption rate of these measures is still limited. This paper develops a profit maximizer theoretical framework to explain by the Heckman method the farmer sign-up decision and the area to put under an AES characterised by a change in the crop pattern. One weakness of this methodology is that it does not account for the upper censure of the enrolled area which might be constrained by the available eligible area. Thererefore, the adoption decision is also compared with a simple tobit with a lower and an upper bound for the whole sample. Technical factors as well as social capital variables are included in order to take into account both technology and transaction costs. Estimation results shows that there is an adoption barrier derived from the initial farm technical assets and know-how affecting the fixed compliance costs of introducing the new crop. In addition, there is an adoption barrier derived from transaction costs which are reduced in the presence of social networks.

Key-words: Agri-environmental scheme; microeconomics; fixed costs; technical and social capital determinants.

RE-CONSIDERING AGRI-ENVIRONMENTAL PREMIUMS: THE IMPACT OF FIXED COST IN ENROLMENT DECISION.

I. INTRODUCTION

Agri-environmental schemes (AES) are the main policy instrument currently available in the European Union to foster improvements in the relationship between agriculture and the environment. Over 35 million hectares were under some kind of AES in EU-15 in 2003 with an overall 3.7billion € in public funds being allocated annually to this policy and an overall expenditure of 14 billion € of EAGGF funds during the 2000-2006 period (DG AGRI, 2006). Payment levels for each AES are calculated based on supply side approaches, aiming at compensating forgone profits and additional costs (article 39-4, Regulation 1698/2005). Formerly, under Agenda 2000, a 20% incentive was foreseen in some cases, this option has been removed for the current programming period although transaction costs, if necessary, can also be compensated for.

Prior research has identified that premiums based on forgone profit might not be sufficient to assure farmer participation. Cooper and Signorello (2007) show how risk-related issues can require premiums to more than cover the mean loss in profit associated with adoption. They back their theoretical assumption estimating this additional payment comparing contingent valuation estimates of willingness to accept with actual forgone profits. Additionally Barreiro-Hurlé *et al*. (2007) have shown that sign-up decision is not solely affected by farm technical characteristics, thus identifying the limited effect of premiums in fostering adoption, specially for low requirement measures. These results point at the fact that even the 20% incentive was not sufficient to foster AES sign-up, thus partially explaining the low enrolment rates detected throughout the EU for AES. While Austria, Finland and Luxembourg have more than two thirds of the UAA involved in agri-environmental measures; in Belgium, Denmark, Greece, the Netherlands and Spain the coverage is just a mere 5% of their total UAA (Utilised Agricultural Area) (Glebe and Salhofer, 2007).

This paper expands the understanding the effect of supply side estimated premiums in AES participation, considering the potential effects of fixed costs associated with sign-up. Several studies have considered factors influencing farmers' participation. They can be categorised in four main categories (Vanslembrouck et al., 2002), programme (type of measure, compensation paid, application costs, etc.) and market (food and environment demand) characteristics constitute the so-called extrinsic factors while farm (size, crop portfolio, etc.) and individual farmer (age, education, etc.) characteristics are intrinsic factors. Fixed costs related to adoption would be related to costs that do not vary with the amount of area enrolled and are mainly related with investments (both assets and know-how) needed to implement AES. An additional source of fixed costs can be transaction costs (TC), which are increasing with asset specificity. Assets are specific when they are sunk, i.e., not profitable in another transaction. Therefore actions and warrants needed to secure the transaction entail transaction costs which are themselves sunk. There is empirical evidence that AES requiring higher specific assets involve higher transaction costs, and that some transaction costs do not depend on the enrolled area: they are fixed costs (Ducos and Dupraz, 2007). Logically such fixed transaction costs should accompany fixed costs of specific assets. One special case of these costs is related to the effect of the specific technology used in the crop produced previously to the implementation of the AES in the case of schemes based on a change in the crop pattern. A higher investment or specialization of the farmer implies higher land profitability, inducing a higher loss when the crop is removed. This paper tests whether fixed costs do indeed exist for AES implementation when these are asset specific and therefore provides evidence on whether the current approach to set premiums levels is adequate to foster adoption of this type of schemes.

The rest of the paper is structured as follows: section II presents the conceptual framework with the theoretical model adapted to test the research hypothesis. Section III includes a description of the AES selected for corroborating the theoretical hypothesis as well as the field work undertaken and the estimated econometric model. Next, model estimation results are presented and section V provides a summary of the main findings and the policy recommendations derived from them.

II. CONCEPTUAL FRAMEWORK

In the present analysis farmers are considered as profit maximizers when faced with the option whether to sign-up or not for an AES. AES adoption is thus based on an increase in land profitability derived from the change in practices and/or land allocation. The profit structure is defined as to consider the effects of fixed costs associated either with current or alternative land management and transaction costs associated with AES implementation. Considering a simplified two activity model, where activity *c* is considered current practice and activity *a* the alternative proposed under a determined AES, this profit function can be presented as [1]. Farmers' face a surface restriction in which the total eligible area (S_T) is allocated between the two competing options, current production and AES implementation.

$$Max\Pi = \overbrace{\Pi^c(p_c, S_c, Z^T) - FC_C(Z^T)}^{a} + \overbrace{\Pi^a(p_a, S, Z^T) - FC_a(Z^T)}^{b} + \\ + \overbrace{\rho S_a - TC(Z^T, Z^{SCt})}^{c} \qquad [1]$$

$$\text{s.t} \qquad S_T = S_C + S$$

Profit is split into three components, that associated with current production (a), that derived from implementation of AES (b) and that related with AES premium (ρ) and transaction costs (TC) (c). For each land use option, fixed costs are separately considered. Production associated profit depends on the variable input-output prices (p_i), on the area under cultivation (S_i) and on technical factors (Z^T). Fixed costs (FC_i) are assumed to be totally explained by Z^T, while fixed TC associated with AES implementation depends on Social Capital variables (Z^{SC}). Individual crop profit functions are assumed to be increasing and quasi concave with respect to the area allocated to the corresponding crop.

To gain understanding of the effect of FC on sign-up decision two cases are considered, one where land use *a* existed before AES implementation and one were it did not. If land use *a* was already present in the farm, the land allocation equilibrium before AES implementation implies that fixed costs are covered for both crops and marginal returns are equal, equation [2], where S^* is the optimal area for use *a*.

$$\Pi_s^c(S_T - S^*) = \Pi_s^a(S^*) \qquad [2]$$

The introduction of an AES displaces this equilibrium to $S^{*\,AES}$ as marginal profit for land use *a* is increased as long as TC are covered, equation [3], while fixed costs associated with each crop remain unchanged in the new allocation of land.

$$\Pi_s^c(S^{*AES}) = \Pi_s^a(S^{*AES}) + \rho$$
$$\text{s.t. } \Pi^c(S_T - S^{*AES}) - \Pi^c(S_T - S^*) + \Pi^a(S^{*AES}) - \Pi^a(S^*) + \rho S^{*AES} \geq TC \qquad [3]$$

On the contrary if land use *a* was not present in the farm before AES implementation, fixed costs start playing a role. The restriction in equation [3] must be re-written to take this into account and is now [4].

$$\Pi^c\left(S_T - S^{*AES}\right) - \Pi^c\left(S_T\right) + \Pi^a\left(S^{*AES}\right) + \rho S^{*AES} \geq TC + FC_a \qquad [4]$$

FC costs related to current land use are not taken into account, because they do not change with the reduction of cereal area, although they might play a role through their effect on land profitability related to this use, specially if they are not recoverable (i.e. sunk costs).

III. CASE STUDY

In order to test this hypothesis, a survey of eligible farmers for an alternative crop AES (ACM) have been carried out. This measure requires rain-fed land allocation to alfalfa thus fitting our theoretical model and allowing to consider both farmers already implementing this land use and those facing a land use change[1]. This measure can be considered as a high-asset specificity measure due to the change in the crop pattern, requiring additional know-how and an opportunity cost due to the loss of cereal output when alfalfa harvest is not assured due to weather variability. Fieldwork has been undertaken in three counties in Aragón (Northern Spain), with sample size discretionally allocated to over-represent enrolled farmers (40% of surveys were addressed to enrolled farmers). This requirement results in a small sample size as actual uptake in the area is limited (107 farmers representing a 2.8% uptake rate) and even surveying all farmers enrolled and accessible[2] , resulted in a total sample size of 156. Non-enrolled farmers were randomly selected from the different municipalities according to the overall percentage of farmers.

[1] A detailed description of measure requirements can be found in BOA (2005).
[2] Differences between total sign-ups (107) and interviewed farmers (62) are due to same farm-hold applying for more than one contract (two cases), contact data not facilitated by the managing authority (36 cases) or farmer not willing to participate in the survey (seven cases).

The questionnaire used was designed by the research team after a thorough review of previous research, agricultural structure in the area and interviews with AES managing authority. An initial version was field tested with 5 farmers for comprehension before generating the final version. The survey was conducted during the period April-June 2007 by a market research company, which employed interviewers with agronomic background and trained *in situ* by the research team. The final version of the questionnaire gathered data regarding three main topics: a) farm basic data with special interest in cattle management, b) attitudes, opinion, knowledge and enrolment in AES and c) basic farmer socio-economic data[3].

In order to evaluate the structural decision on the adoption of the agri-environmental policy and to evaluate to what extent "fixed costs" is limiting adoption, two econometric models have been estimated. First, results from a double censored tobit model on the area enrolled is compared with a probit model based on the decision to participate on the program. The double censored tobit model best suits a situation where FC are not relevant, that is equation [1] minus the FC and TC components. If this model is maximized without considering the surface restriction, the optimal surface allocation to use *a* (S^{**AES}) can be negative, compliant with the restriction or higher than the available eligible area. It is the dual value of the marginal profit of land if the farmer were obliged to contract. The actual enrolled area *S* is a left censored variable since it equals zero when the contract is not profitable. It equals S^{**AES} when the surface restriction in equation [1] holds. It is also a right censored variable if S^{**AES} exceeds S_T. Therefore the adapted econometric specification for S^{*AES} is a simple tobit with upper and lower censures and S^{**AES} as a latent variable. Under this modelling framework, determinants of fixed transaction costs, like the source of information about AES or the investment in skills that do not depend on the amount of enrolled area, must not be significant. If this is so, the tobit results must be compatible with the probit estimation of the probability to enrol, because such a decision would also be governed by the same latent variable S^{**AES}.

The upper and lower bounded tobit model is based on the fact that the latent underlying regression based on the area under contract (S_i^{**AES}) is upper censored by the eligible area (or one when modelling the share of the land under the AES) and lower censored by zero. Its specification is defined in equation [5] and parameters α estimated by the maximum likelihood.

[3] The questionnaire is available upon request to the authors.

$$
\begin{array}{llll}
s_i^{**AES} = Z_i\alpha + \varepsilon_i & E(\varepsilon_i) = 0 & E(\varepsilon_i^2) = \gamma^2 & \\
if \quad s_i^{**AES} \le 0, & then \quad s_i = 0 & & \\
if \quad s_i^{**AES} \ge eligible & area, \quad then & s_i = eligible \quad area & \\
if \quad 0 < s_i^{**AES} < eligible & area, \quad then & s_i = s_i^{**AES} = Z_i\alpha + \varepsilon_i &
\end{array}
\qquad [5]
$$

To test whether FC do play a role, estimates obtained from[5] are compared with those obtained using a two stage Heckman model. Unlike the tobit model, this approach explicitly splits the contracting behaviour into two decisions related to each other: participating or not in the AES and how much surface is enrolled. This procedure allows identifying factors influencing adoption and area enrolled decisions. If results for the first step are different than those obtained in the tobit model, then some evidence regarding the role of FC can be obtained. Moreover, under the assumption that "fixed costs" are not related to the area enrolled in the AES, differences in estimates between sign-up and enrolled decisions would further support FC existence. If determinants significantly influence the adoption without influencing the area under contract, or influence both in opposite ways, this means that they are determinants of fixed costs and that fixed costs exists. If both adoption and enrolled area of contractors are governed by the same determinants in the same way, it means that there are no significant fixed costs. In this case the adoption and the enrolled area both depend on the comparison between the offered premium and the difference in marginal returns of alternative land uses.

The first step on the Heckman method is a probit model analysing the probability of contracting based on the assumption that the payment is higher than the change in profit taking into account both transaction and fixed costs as defined in equation [1]. The latent variable of the probit model, z, is defined on equation [6], z is the difference in profit with and without contract, assuming farmers consider the optimal enrolled area if they would be obliged to contract. The results of the first step are used to calculate the inverse mills ratio (λ). The second step models the contracted area (S^{*AES}) using a OLS regression, including λ to take into account the outcomes of the first step. This parameter accounts for differences between participants and non-participants captured by the error term. The contracted area is the optimal area, given the contract is accepted.

$$
z = \Pi^c(S_T - S^{*AES}) - \Pi^c(S_T - S^*) + \Pi^a(S^{*AES}) - \Pi^a(S^*) + \rho S^{*AES} - TC - FC_a \qquad [6]
$$

This double decision framework is modelled as follows:

$$z_i = Z_i\beta + u_i \qquad E(u_i) = 0 \qquad E(u_i^2) = \sigma^2$$
$$s_i^{*AES} = Z_i\alpha + \varepsilon_i \qquad E(\varepsilon_i) = 0 \qquad E(\varepsilon_i^2) = \gamma^2 \qquad [7]$$
$$\mathrm{cov}(u,\varepsilon) = \theta.\gamma.\sigma \qquad \forall i$$

Where Z is the vector reflecting variables which are assumed to affect the enrolment decision and/or surface enrolled. The function Φ is the cumulative function of the reduced and centred normal distribution and φ the corresponding density function. The first step is modelled as a simple probit model where:

$$\Pr[Y_i = 1] = \Pr[z_i > 0] = \Phi\left[Z_i \frac{\beta}{\sigma}\right] \qquad [8]$$

This model allows estimating $\frac{\beta}{\sigma}$ under the assumption of normality for u_i. For the second step the conditional expected value of the area enrolled, s_i^*, is calculated imposing that z_i is strictly positive.

$$E(s_I^{*AES} / z_i > 0) = E(Z_i\alpha + \varepsilon_i / z_i > 0) = Z_i\alpha + \delta \overbrace{\frac{\varphi\left(Z_i \frac{\beta}{\sigma}\right)}{\Phi\left[Z_i \frac{\beta}{\sigma}\right]}}^{\lambda} \qquad [9]$$

Parameters α and $\delta = \theta.\gamma$ can be estimated without bias by OLS for $s_i > 0$. The optimal area under contract is derived from equation [3] unrestricted, therefore depending on farm technical factors affecting the marginal profit of both crops, and not affected by fixed costs.

In order to test the effect of fixed costs the following assumptions are put forward. Using the same explanatory variables to model the contracted area (S^{*AES}), if there were no fixed costs, the estimated coefficients in both steps will be similar, scaled by λ, that is the latent variable and the enrolled area only depend on the comparison between the offered premium and the difference in marginal returns of alternative land uses. If not, the effect of technical variables limiting adoption, due to asset specificity cereal specialization, new compliance costs associated with the introduction of alfalfa and/or *TC,* would be detected.

For the objective of this research, fixed cost definition becomes a key issue. Fixed costs are related to fixed "compliance costs" associated with new land use specific investments and know-how, as well as to the pre-existing land use investments and fixed transaction cost related to information gathering before contracting, contract signing and bureaucratic costs for the contract follow-up.

IV. RESULTS

Table 1 presents the variables used to measure the different concepts put forward in equation [1], where their impact is hypothesized to be more relevant and the expected sign on the adoption decision (equation [8]).

Table 1. Selected explanatory variables, concept where main impact is hypothesized and expected effect on AES sign up

	Variable	**Description**	**Main impact on…**	**Expected sign**
Z_T	ELI_AREA	Eligible area (number of ha)	-o-	+
	SPE-NON-IRR-CERL	Non-irrigated cereal specialization farmer (1 if yes)[4]	Π^c	-
	IRR-CEREAL	Crop distribution includes irrigated cereal (1 if yes)	Π^c	-
	HARVESTER	Farm owns harvester (1 if yes)	Π^c	-
	NON-I-ALFALFA-00	Farm already had pulse crops before AES (1 if yes)	FC_a	+
	IRR-ALFALFA	Crop distribution includes irrigated alfalfa (1 if yes)	Π^a & FC_a	+
	LSU	Presence of livestock in the farm-hold (1 if yes)	Π^a & FC_a	+
Z_{SC}	COOPERATIVE	Farmer is a member of a cooperative (1 if yes)	Π^c & TC	- & +
	TRAINING	Farmer attends agricultural formation courses (1 if yes)	TC	+
	INF-AES-FINEN	Farmer obtains information related to AES from financial entities (1 if yes)	TC	+
	ADD-INF-SOURCE	Farmer uses more than one source for technical advice (1 if yes)	TC	+

[4] This variable is constructed assuming specialization implies farm has a non-irrigated cereal area above the mean of farms with this land use (58 ha). Results are robust with regards with alternative specialization measures (i.e. area above C3).

Tables 2 and 3 display the results from the double censored model estimation (equation [5]) and the results of the estimation of the two-step Heckman model (equations [8] and [9]) respectively.

Table 2. Double censored tobit model for the area enrolled and the % of eligible area enrolled

		Area enrolled			**Share area enrolled/eligible area**		
Concept	**Variable**	***Coefficient***	***S.Eror.***	***p-value***	***Coefficient***	***S.Eror***	***p-value***
	Constant	-0.721	8.455	0.9321	0.293	0.151	0.0516
Z^T	ELI_AREA (ha)	0.162	0.039	0.0000	-1.820	0.001	0.9793
	SPE-NON-IRR-CER	-27.151	8.570	0.0015	-0.479	0.156	0.0022
	IRR-CEREAL	-8.237	7.346	0.2621	-0.308	0.131	0.0187
	HARVESTER	-52.491	16.813	0.0018	-0.491	0.265	0.0641
	NON-I-ALFALFA-00	14.447	6.550	0.0274	0.243	0.119	0.0415
	IRR-ALFALFA	15.343	6.900	0.0262	0.326	0.124	0.0085
	LSU	-3.706	6.737	0.5822	0.035	0.121	0.7735
Z^{SC}	COOPERATIVE	-11.308	7.277	0.1202	-0.310	0.130	0.0168
	FORMATION	5.377	6.555	0.4120	0.079	0.118	0.5063
	INF-AES-FINEN	24.709	10.515	0.0188	0.230	0.191	0.2279
	ADD-INF-SOURCE	8.826	7.978	0.2686	0.178	0.144	0.2152
γ		26.583	2.831	0.0000	0.487	0.054	0.0000
Model Fit Statistics		N = 104 -2log likelihood model = 542.578			N = 104 -2log likelihood model = 142.764		

Table 3. Two-step adoption model for alternative crop AES.

		Sign-up decision (z)			**Area enrolled (s)**		
Concept	**Variable**	***Coefficient***	***S.Error.***	***p-value***	***Coefficient***	***S.Error***	***p-value***
	Constant	-0.322	0.402	0.4231	41.954	21.267	0.0485
Z^T	ELI_AREA (ha)	0.002	0.002	0.3305	0.144	0.040	0.0004
	SPE-NON-IRR-CER	-0.894	0.455	0.0494	-5.510	9.854	0.5760

	IRR-CEREAL	-0.957	0.365	0.0086	13.034	10.075	0.1958
	HARVESTER	-2.048	0.841	0.0149	-17.236	22.088	0.4352
	NON-I-ALFALFA-00	1.091	0.347	0.0016	-9.108	10.384	0.3804
	IRR-ALFALFA	0.597	0.361	0.0982	8.580	7.629	0.2607
	LSU	0.765	0.346	0.0269	-24.212	9.721	0.0128
Z^{SC}	COOPERATIVE	-0.702	0.380	0.0647	0.052	7.899	0.9948
	FORMATION	0.869	0.366	0.0176	-10.724	8.796	0.2228
	INF-AES-FINEN	1.822	0.738	0.0136	0.222	14.277	0.9876
	ADD-INF-SOURCE	0.662	0.451	0.1425	5.740	8.606	0.5048
λ					-26.607	21.684	0.2198
Model Fit Statistics		N = 104 -2log likelihood model = 88.515 χ^2= 51.79 p-value= 0.0000 Mc Fadden R^2 = 0.3691 % of correct predictions = 78.8			N = 62 R^2 = 49.6% χ^2= 57.01 p-value= 0.0000		

The comparison of the double censored tobit model and the first stage of the Heckman method support the existence of fixed costs, as technical variables which are significant for the sign-up decision do not influence the enrolled area for the full sample (IRR-CEREAL, LSU) and vice versa (ELI_AREA). Additional support for this hypothesis is obtained comparing both steps in the Heckman model, as significant technical variables of the first step are no longer significant for the second and there is a sign reversal for the presence of livestock which positively affects sign-up and negatively enrolled area.

Some information regarding the nature of the fixed costs associated with this AES can be obtained from a detailed analysis of individual variables. Social capital variables, which are significant for the adoption and are not for the enrolled area, would reflect that fixed costs are not only technical in nature but include transaction costs. Technical variables describing specialisation in cereal crops impede adoption, while the presence of alfalfa before the scheme or the presence of irrigated alfalfa favours adoption. This points at crop management know-how as a potential source of fixed costs although cereal specialization could be signalling higher marginal profits for this crop and the presence of corner solutions due to a lack of total surface (i.e. $S^{**AES} > S_T$).

Results explaining the second decision in the Heckman model are not entirely satisfactory, as only two variables are significant. The second step in the Heckman model is not upper censored and thus reported results are not entirely satisfactory when explaining the area enrolled for the adopters sub-sample. As λ is not significantly different from zero, it means that other explanatory variables are sufficient to take into account the selection bias related to the difference between the two categories (enrolled/non-enrolled). This result allows us to estimate an upper censored tobit model for the area under the AES and its share considering only farmers entering the scheme ($z_i > 0$). In this model the upper censor is defined by the eligible area. Results for this model are presented in Table 4, where variables that were not significant in the second step have been excluded from the estimation

Table 4. Simple tobit upper censored for the area enrolled and the % of eligible area enrolled (adopters sub-sample)						
	Area enrolled			**Share area enrolled/eligible area**		
Variable	***Coefficient***	***S.Error***	***p-value***	***Coefficient***	***S.Error***	***p-value***
Constant	29.904	5.067	0.0000	0.748	0.087	0.0000
ELI_AREA	0.130	0.030	0.0000	-0.001	0.000	0.0150
SPE-NON-IRR-CER	-18.689	-2.701	0.0069	-0.376	0.107	0.0005
HARVESTER	-24.947	-1.576	0.1150	0.293	0.247	0.2342
IRR-ALFALFA	15.723	2.752	0.0059	0.240	0.086	0.0054
LSU	-24.530	5.067	0.0000	-0.307	0.092	0.0009
γ	19.138	1.914	0.0000	0.298	0.031	0.0000
Model Fit Statistics	Number of observations = 62 -2log likelihood model = 460.831			Number of observations = 62 -2log likelihood model = 44.824		

In this model, variables that are significant explaining the area under contract are related to the marginal profitability of land, influencing negatively when cereal crop is considered (SPE-NON-IRRI-CER, HARVESTER) and positively under the alternative crop (IRRI-ALFALFA, LSU). Thus it seems that the decision on how much land to enrol is explained by relative marginal profits as presented in equation [2]. The effect of LSU deserve further discussion, as it restricts the area enrolled under the AES while promoting participation. Farmers have with livestock have lower FC associated to the new crop, however the marginal profit of land under the AES decreases faster than for farmers with no livestock. Moreover, undertaking a comparative analysis between farmers with and without livestock shows that farmers with livestock have smaller holdings and, correspondingly less eligible surface.

V. Summary and policy implications

Reported results support the existence of fixed revealed by the livestock and the Social Capital variables, affecting respectively on the compliance cost of alfalfa and on Transaction Cost.

Additional results with the simple tobit on contractors' sample also confirm the microeconomic assumption. This is explained by the positive effect of the eligible area for the enrolled area and negative for the share of enrolled in eligible area meaning that we have corner solutions. Some farmers would like to have more eligible area to enlarge enrolled area. .[5]

It is worth mentioning as well the effect of the initial technical assets on explaining adoption in the AES characterised by a change in the land allocation. Specialized cereal growers with higher marginal profitability of land due to an investment on fixed costs (like the harvester[6] or irrigation) are less willingness to apply for the AES as it is less profitable to change the crop pattern.

Supporting the analysis undertaken by Ducos and Dupraz (2007) that reflects the constraints involved by specific investment regarding the AES compliance costs, more technically demanding measures implying a change in the crop pattern deriving in fixed compliance cost are less frequently profitable and adopted than less demanding measures. Consequently in order to increase the uptake rate of measures implying more environmental outcomes, policy makers should take into consideration the adoption barrier derived from fixed costs and should be taken into account in the payment calculation.

The positive effect of social networks in disseminating information and increasing the uptake rate reducing transaction costs is considerable, however it should be enhance as one third of the farmers were not aware of the AES existence.

[5] 10 farmers have contracted 100 % of the eligible surface.

[6] This fixed cost would be a sunk cost if there is a complete removal of the cereal crop

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